This question paper contains **2** printed pages]

YC—42—2024

FACULTY OF HUMANITIES, (ARTS, COMMERCE, SCIENCE)

B.A./B.Com./B.Sc. (Third Semester) EXAMINATION

NOVEMBER/DECEMBER, 2024

ENGLISH (Compulsory)

Paper-III

(AECC : English Communication)

(Thursday, 28-11-2024) **Time : 2.00 p.m. to 4.00 p.m.**

Time—2 *Hours* *Maximum Marks*—50

N.B. :— (*i*) *All* questions are compulsory.

(*ii*) Figures to the right indicate full marks.

1. Explain the theme of love, friendship, compassion and charity in the short story, "The Model Millionaire" 10

Or

Explain theme of 'sense of belonging' in the short story 'The Lost Child'.

2. 'The Gift of India' as a true patriotic poem. Explain. 10

Or

Write a critical appreciation of the poem, 'Desiderata'.

P.T.O.

3. Discuss various influences on the personality of Subhas Chandra Bose narrated in 'At School'. 10

Or

Explain how Milkha Singh's 'The Flying Sikh' reflects that 'there are no shortcuts to success'.

4. Justify the title of the poem 'The Gift of India'. 10

Or

Illustrate a young man's struggle in the Oscar Wilde's short story entitled 'The Model Millionaire'.

5. (A) Change the reported speech : 5

(*i*) Gopu said, "The bell is ringing".

(*ii*) "What a beautiful flower!" Pranita said.

(*iii*) I said, "I shall bring lots of potatoes."

(*iv*) The man said to the boys, "Is this your play ground ?"

(*v*) He said to me, "Help me in setting the accounts".

(*vi*) The teacher said, "The earth moves round the sun".

(*vii*) Pavan said, "I like my parents because they love me".

(B) Write short answer to the following (any *one*) : 5

(*i*) Fundamentals of writing for print media.

(*ii*) Write a note on Print Media.

This question paper contains **2** printed pages]

YC—12—2024

FACULTY OF ARTS/COMMERCE/SCIENCE

B.A. (Second Year) (Third Semester) EXAMINATION

NOVERMBER/DECEMBER, 2024

HINDI (S.L.)

(कथेत्तर गद्य-III)

(Tuesday, 26-11-2024) **Time : 2.00 p.m. to 4.00 p.m.**

Time—2 *Hours* *Maximum Marks*—50

N.B. :— (*i*) **सभी** प्रश्न अनिवार्य हैं।

(*ii*) सभी प्रश्नों के आगे अंक दिए गए हैं।

1. 'औरंगजेब की आखिरी रात' एकांकी को स्पष्ट कीजिए। 10

अथवा

'प्रवास की डायरी' के आशय को बताइए।

2. "उठो, जागो और तब तक रुको नहीं, जब तक लक्ष्य प्राप्त न हो जाए", 'युवाओं से' संबोधन के आधार पर समझाइए। 10

अथवा

'काशी के नाम' पत्र का उद्देश्य अपने शब्दों में लिखिए।

3. 'नाखून क्यों बढ़ते हैं' निबंध की वैचारिकता को स्पष्ट कीजिए। 10

P.T.O.

अथवा

रामरती का चरित्र-चित्रण कीजिए।

4. 'इंस्पेक्टर मातादीन चाँद पर' व्यंग्य में भारतीय पुलिस की कार्य-पद्धति को विशद कीजिए। 10

अथवा

वीरांगना 'कनकलता' के स्वदेश प्रेम को स्पष्ट कीजिए।

5. टिप्पणियाँ लिखिए :

(अ) जीनत का चरित्र-चित्रण कीजिए। 5

अथवा

रसायन के विघातक परिणाम।

(ब) आ. हजारीप्रसाद द्विवेदी का परिचय दीजिए। 5

अथवा

'स्त्री जो महज त्वचा है' लेख का उद्देश्य।

This question paper contains **2** printed pages]

YC—13—2024

FACULTY OF ARTS/COMMERCE/SCIENCE

B.A./B.Com./B.Sc. (Second Year) (Third Semester) EXAMINATION

NOVERMBER/DECEMBER, 2024

MARATHI (S.L.)

(अक्षरविद्या-III)

(Tuesday, 26-11-2024) **Time : 2.00 p.m. to 4.00 p.m.**

Time—2 *Hours* *Maximum Marks*—50

N.B. :— (*i*) **सर्व** प्रश्नांना समान गुण आहेत.

(*ii*) **सर्व** प्रश्न सोडवणे अनिवार्य आहेत.

1. पुढीलपैकी कोणताही **एक** प्रश्न सोडवा : 10

(*i*) संत गाडगेबाबा यांनी 'शिक्षणविषयक कीर्तन' मधून कोणते विचार मांडले आहेत ? ते लिहा.

(*ii*) 'आराधन' या पाठाचा आशय तुमच्या शब्दांत लिहा.

2. पुढीलपैकी कोणताही **एक** प्रश्न सोडवा : 10

(*i*) बुद्धधम्म आणि पळस फुलांचे नाते कसे अतुट आहे ? ते 'थेरबन' या पाठाच्या आधारे स्पष्ट करा.

(*ii*) 'अक्षरांची पहाट' या कथेचा आशय स्पष्ट करा.

P.T.O.

3. पुढीलपैकी कोणताही **एक** प्रश्न सोडवा : 10

(*i*) संत कान्होपात्रा यांनी अंत:करणातील व्याकूळता आपल्या अभंगातून कशी व्यक्त केली आहे ? ते लिहा.

(*ii*) 'सरावन महिना आला की' या कवितेचा आशय तुमच्या शब्दात स्पष्ट करा.

4. पुढीलपैकी कोणताही **एक** प्रश्न सोडवा : 10

(*i*) कवी नागराज मंजुळे यांनी लेखनीचे महत्त्व आपल्या कवितेतून कसे अधोरेखित केले आहे ? ते लिहा.

(*ii*) 'किनकीन घुंगराची' या कवितेतील स्त्रीमनाची वेदना स्पष्ट करा.

5. पुढीलपैकी 'अ' व 'ब' गटातील प्रत्येकी **एक** टीप लिहा : 10

(अ) (*i*) अर्धविराम

(*ii*) अनुप्रास

(ब) (*i*) प्रश्नचिन्ह व उद्‌गार चिन्ह

(*ii*) यमक

This question paper contains **2** printed pages]

VA—28—2024

FACULTY OF SCIENCE

B.Sc. (Second Year) (Third Semester) EXAMINATION

NOVEMBER/DECEMBER, 2024

(New Pattern)

BOTANY

Paper–VI

(Plant Anatomy)

(Thursday, 5-12-2024) **Time : 2.00 p.m. to 4.00 p.m.**

Time—2 *Hours* *Maximum Marks*—40

N.B. :— (*i*) Attempt *all* questions.

(*ii*) Draw well labelled diagrams wherever necessary.

1. Define complex tissue. Explain in detail an account of xylem. 15

Or

Write notes on :

(*a*) Shoot apical meristem 8

(*b*) Histogen theory. 7

2. Describe the anatomical structure of Dicotyledons stem (Sunflower). 15

P.T.O.

Or

Write notes on :

(*a*) Anomalous secondary growth in Mirabilis stem. 8

(*b*) Economical importance of wood. 7

3. Write short notes on (any *two*) : 10

(*i*) Scope of Anatomy

(*ii*) Parenchyma

(*iii*) Types of vascular bundles

(*iv*) Rhytidomes.

This question paper contains **2** printed pages]

VA—46—2024

FACULTY OF SCIENCE AND TECHNOLOGY

B.Sc. (Second Year) (Third Semester) EXAMINATION

NOVEMBER/DECEMBER, 2024

(New Pattern)

BOTANY

Paper–VII

(Plant Physiology and Biochemistry)

(Saturday, 7-12-2024) **Time : 2.00 p.m. to 4.00 p.m.**

Time—2 *Hours* *Maximum Marks*—40

N.B. *:—* (*i*) Attempts *all* questions.

(*ii*) Illustrate your answer with suitable labelled diagrams, wherever necessary.

1. What is transpiration ? Give the types and describe in detail K^+ pump theory. 15

Or

Describe in brief :

(*a*) Munch-Mass flow hypothesis. 8

(*b*) Physiological roles and deficiency symptoms of Ca and Mg. 7

P.T.O.

2. What is seed germination ? Write a note on types of seed germination. 15

Or

Describe in brief :

(*a*) Biological functions of carbohydrates. 8

(*b*) Biological functions of flavonoids. 7

3. Write short notes on (any *two*) : 10

(*a*) Plasmolysis

(*b*) Hydroponic technique

(*c*) Practical applications of Auxins.

(*d*) Primary strcuture of proteins.

This question paper contains **3** printed pages]

VA—08—2024

FACULTY OF SCIENCE

B.Sc. (Second Year) (Third Semester) EXAMINATION

NOVEMBER/DECEMBER, 2024

(New Pattern)

CHEMISTRY

Paper–VI

(Organic and Inorganic Chemistry)

(Saturday, 30-11-2024) **Time : 2.00 p.m. to 4.00 p.m.**

Time—2 *Hours* *Maximum Marks*—40

N.B. *:—* Attempt *all* questions.

1. Solve any *three* of the following : 3×5=15

   (*a*) Explain the brief separation of Zn^{++} and Mn^{++} with necessary chemical reactions.

   (*b*) What is solubility product ? Explain its role in the separation of III A and III B group radicals.

   (*c*) Explain the role of the following organic reagents in qualitative analysis :

      (*i*) 1, 10-phenanthrolin

      (*ii*) α-Benzoinoxime.

P.T.O.

(*d*) Why is water known as universal solvent ? Explain dielectric constant property of solvent.

(*e*) Explain the following reactions in liq.NH_3 :

(*i*) Precipitation

(*ii*) Ammonolysis.

2. Solve any *three* of the following : 3×5=15

(*a*) Explain Benzoin condensation reaction with mechanism.

(*b*) How will you synthesize Anthranilic acid by :

(*i*) Phthalimide

(*ii*) O-Nitro-toluene

(*c*) What are organolithium compounds ? How will you obtain the following from methyllithium :

(*i*) Ethanol

(*ii*) 2-Propanol.

(*d*) Explain Clemmensen reduction reaction with mechanism.

(*e*) How will you synthesize the following from ethyl acetoacetate :

(*i*) Propionic acid

(*ii*) Acetyl acetone.

3. Solve any *two* of the following : 2×5=10

(*a*) (*i*) What is the action of the following on salicylic acid ?

(*a*) Br_2

(*b*) HNO_3.

(*ii*) What is the action of the following on Benzoic acid :

(*a*) $LiAlH_4$

(*b*) Conc. HNO_3 + Conc. H_2SO_4.

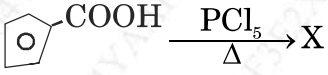
(*b*) Explain saponification value and Iodine value.

(*c*) What are detergents ? Give the classification of detergents.

(*d*) Predict the X in the following reactions :

(*i*) $R - \overset{\overset{O}{\|}}{C} - H + BrCH_2COOC_2H_5 \xrightarrow[(ii)\ H^+]{(i)\ Zn + \text{ether}} X$

(*ii*) $CH_3 - CH_2 - CH_2 - COCl \xrightarrow{X} CH_3 - CH_2 - CH_2 - CH_2OH$

(*iii*)  $\xrightarrow[\Delta]{PCl_5} X$

(*iv*) $\overset{\overset{O}{\|}}{C} = O + X \xrightarrow{\text{dry ether}} CH_3 - \overset{\overset{O}{\|}}{C} - OH$

(*v*) $2CH_3 - \overset{\overset{O}{\|}}{C} - OC_2H_5 \xrightarrow[(ii)\text{dil.HCl}]{(i)\ C_2H_5ONa} X$

This question paper contains **2** printed pages]

VA—19—2024

FACULTY OF SCIENCE

B.Sc. (Second Year) (Third Semester) EXAMINATION

NOVEMBER/DECEMBER, 2024

(CBCS/New Pattern)

CHEMISTRY

Paper–VII

(Physical and Inorganic Chemistry)

(Tuesday, 3-12-2024) **Time : 2.00 p.m. to 4.00 p.m.**

Time—2 *Hours* *Maximum Marks*—40

N.B. *:—* (*i*) Attempt *all* questions.

(*ii*) Use of logarithmic table and calculator is allowed.

1. Attempt any *three* of the following : 15

(*a*) What is radioactivity ? Explain the characteristics of β(beta) particle.

(*b*) Explain the nuclear stability on the basis of N/Z ratio and packing fraction.

(*c*) Write notes on :

(*i*) Group displacement law

(*ii*) Carbon dating.

P.T.O.

(*d*) Explain any *two* factors affecting on precipitation.

(*e*) Explain the following steps involved in gravimetric analysis :

(*i*) Digestion

(*ii*) Filtration and washing.

2. Solve any *three* of the following : 15

(*a*) Derive de-Broglie's equation. Calculate de-Broglieœ's wavelength of a body of mass 100 gm moving with velocity 1000 m/s.

($h = 6.626 \times 10^{-34}$J.s)

(*b*) Explain photoelectric effect on the basis of quantum theory.

(*c*) State first law of thermodynamics and give need for second law of thermodynamics.

(*d*) Discuss entropy change in :

(*i*) Fusion of solid.

(*ii*) Vaporization on liquid.

(*e*) Explain sulphur system with phase diagram.

3. Solve any *two* of the following : 10

(*a*) State the explain Compton effect.

(*b*) Write the physical significance of entropy. Calculate the change in entropy for fusion of 1 mole of ice. The melting point of ice is 273 K and molar enthalpy of fusion of ice is 6.0 kJ mol^{-1}.

(*c*) Explain Nernst heat theorem. State third law of thermodynamics.

(*d*) Describe Pb-Ag system on the basis of phase rule.

This question paper contains **2** printed pages]

VA—319—2024

FACULTY OF SCIENCE AND TECHNOLOGY

B.Sc. (Second Year) (Third Semester) EXAMINATION

NOVEMBER/DECEMBER, 2024

(New Pattern)

COMPUTER SCIENCE

Paper VI

(Operating System)

(Saturday, 21-12-2024) **Time : 2.00 p.m. to 4.00 p.m.**

Time—Two Hours *Maximum Marks*—40

N.B. :— (*i*) Attempt *all* questions.

(*ii*) Figures to the right indicate full marks.

1. What is system call ? Explain types of system call in detail. 15

Or

(*a*) Explain protection and security in operating system. 7

(*b*) Explain computer system architecture. 8

2. Explain process concept, process scheduling and threads. 15

P.T.O.

Or

(*a*) Explain operating system services. 7

(*b*) Explain file system structure. 8

3. Write short notes on (any *two*) : 10

(*a*) Memory management

(*b*) Operating system generations

(*c*) Virtual memory

(*d*) File system.

This question paper contains **2** printed pages]

VA—325—2024

FACULTY OF SCIENCE AND TECHNOLOGY

B.Sc. (Second Year) (Third Semester) EXAMINATION

NOVEMBER/DECEMBER, 2024

(New Pattern)

COMPUTER SCIENCE

Paper VII

(Programming in C++)

(Tuesday, 24-12-2024) **Time : 2.00 p.m. to 4.00 p.m.**

Time—Two Hours *Maximum Marks*—40

N.B. :— (*i*) Attempt *all* questions.

(*ii*) Answer suitable data, if necessary.

(*iii*) Draw suitable diagrams, wherever necessary.

1. Explain the basic concepts of object-oriented programming. 15

Or

(*a*) Explain basic data types of C++. 8

(*b*) Explain if statement with example. 7

2. What is function ? Explain function prototyping in detail. 15

P.T.O.

Or

(*a*) What is class ? Explain with example. 8

(*b*) Write a program in C++ to check whether a given number is positive or negative. 7

3. Write short notes on the following (any *three*) : 10

(*a*) Applications of OOP

(*b*) While loop statement

(*c*) Call by value

(*d*) Tokens of C++.

This question paper contains **2** printed pages]

VA—112—2024

FACULTY OF SCIENCE

B.Sc. (Second Year) (Third Semester) EXAMINATION

NOVEMBER/DECEMBER, 2024

(New Pattern)

ELECTRONICS

Paper–VI

(Amplifiers)

(Tuesday, 17-12-2024) **Time : 2.00 p.m. to 4.00 p.m.**

Time—2 *Hours* *Maximum Marks*—40

N.B. :— (*i*) Attempt *all* questions.

(*ii*) Illustrate your answer with labelled diagram wherever necessary.

1. Explain the base bias with emitter feedback and base bias with collector feedback. 15

Or

(*a*) Draw the circuit diagram of CE amplifier with equivalent circuit. Derive the expression for voltage gain (AVe). 8

(*b*) How to find different *h*-parameters in two port network. 7

2. Draw the block diagram of an Op-Amp. Explain the function of each block and write ideal characteristics of an OP-Amp. 15

P.T.O.

Or

(*a*) Explain OP-Amp as adder. 8

(*b*) Explain OP-AMP as a Schmitt's trigger. 7

3. Write short notes on (any *two*) : 10

(*a*) Stability factor for CB and CE circuit

(*b*) Equivalent circuit for BJT transconductance model

(*c*) CMRR

(*d*) Op-Amp as integrator.

This question paper contains **2** printed pages]

VA—156—2024

FACULTY OF SCIENCE

B.Sc. (Second Year) (Third Semester) EXAMINATION

NOVEMBER/DECEMBER, 2024

(New Pattern)

ELECTRONICS

Paper–VII

(Microprocessor and its Applications)

(Thursday, 19-12-2024) **Time : 2.00 p.m. to 4.00 p.m.**

Time—2 *Hours* *Maximum Marks*—40

N.B. :— (*i*) Attempt *all* questions.

(*ii*) Illustrate your answers with suitably labelled diagrams wherever necessary.

1. Draw functional pin diagram of Intel 8085 and discuss function of each pin. 15

Or

(*a*) Give classification of instructions of 8085 and an example of each group. 8

(*b*) Discuss instruction cycle, machine cycle and T-state for microprocessor. 7

2. Explain operating modes of IC 8255 and discuss control word pattern of IC 8255. 15

P.T.O.

Or

(*a*) Discuss Delay subroutine using one register. 8

(*b*) Write an ALP to find sum of two 8-bit numbers. 7

3. Write short notes on (any *two*) : 10

(*a*) Features of Intel 8085

(*b*) Instruction Format

(*c*) ALP for is compliment of an 8-bit number

(*d*) Interfacing of switch using IC 8255.

This question paper contains **2** printed pages]

VA—156—2024

FACULTY OF SCIENCE

B.Sc. (Second Year) (Third Semester) EXAMINATION

NOVEMBER/DECEMBER, 2024

(New Pattern)

ELECTRONICS

Paper–VII

(Microprocessor and its Applications)

(Thursday, 19-12-2024) **Time : 2.00 p.m. to 4.00 p.m.**

Time—2 *Hours* *Maximum Marks*—40

N.B. :— (*i*) Attempt *all* questions.

(*ii*) Illustrate your answers with suitably labelled diagrams wherever necessary.

1. Draw functional pin diagram of Intel 8085 and discuss function of each pin. 15

Or

(*a*) Give classification of instructions of 8085 and an example of each group. 8

(*b*) Discuss instruction cycle, machine cycle and T-state for microprocessor. 7

2. Explain operating modes of IC 8255 and discuss control word pattern of IC 8255. 15

P.T.O.

Or

(*a*) Discuss Delay subroutine using one register. 8

(*b*) Write an ALP to find sum of two 8-bit numbers. 7

3. Write short notes on (any *two*) : 10

(*a*) Features of Intel 8085

(*b*) Instruction Format

(*c*) ALP for is compliment of an 8-bit number

(*d*) Interfacing of switch using IC 8255.

This question paper contains **2** printed pages]

VA—204—2024

FACULTY OF SCIENCE AND TECHNOLOGY

B.Sc. (Second Year) (Third Semester) EXAMINATION

NOVEMBER/DECEMBER, 2024

(New Pattern)

FISHERY SCIENCE

Paper VI

(Fish Diseases Management)

(Saturday, 21-12-2024) **Time : 2.00 p.m. to 4.00 p.m.**

Time—Two Hours *Maximum Marks*—40

N.B. :— (*i*) Attempt *all* questions.

(*ii*) Draw suitable diagram wherever necessary.

1. Explain in detail bacterial dropsy disease in fish. 15

Or

Write short notes on :

(*a*) Effect of stress on fish health. 8

(*b*) Extrinsic factor associated with pH. 7

2. Describe environmental induced disease related to oxygen deficiency. 15

P.T.O.

Or

Write short notes on :

(*a*) White spot 8

(*b*) Argulosis. 7

3. Write notes on any *two* of the following : 10

(*a*) Causes and development of fish disease

(*b*) Fungal gill rot

(*c*) Dactylogyrus

(*d*) Starvation.

This question paper contains **2** printed pages]

VA—267—2024

FACULTY OF SCIENCE AND TECHNOLOGY

B.Sc. (Second Year) (Third Semester) EXAMINATION

NOVEMBER/DECEMBER, 2024

(New Pattern)

FISHERY SCIENCE

Paper VII

(Fish Developmental Biology)

(Tuesday, 24-12-2024) **Time : 2.00 p.m. to 4.00 p.m.**

Time—Two Hours *Maximum Marks*—40

N.B. :— (*i*) *All* questions are compulsory.

(*ii*) Marks of each question are written on right hand side of the respective question.

(*iii*) Illustrate answers with suitable and well labelled diagrams, wherever necessary.

1. Describe gametogenesis in fishes. 15

Or

Write notes on :

(*a*) Modes of reproduction in fishes. 8

(*b*) Gastrulation in fishes. 7

P.T.O.

2. Describe in detail maturity stages in female teleost fishes. 15

Or

Write notes on :

(*a*) Marking and tagging methods of age and growth determination in fishes. 8

(*b*) Factors affecting growth in fishes. 7

3. Write notes on any *two* of the following : 10

(*a*) Types of eggs in fishes

(*b*) Blastula in fishes

(*c*) Gonado Somatic Index (GSI)

(*d*) Ponderal Index.

This question paper contains **3** printed pages]

VA—205—2024

FACULTY OF SCIENCE

B.Sc. (Second Year) (Third Semester) EXAMINATION

NOVEMBER/DECEMBER, 2024

(New Pattern)

INDUSTRIAL CHEMISTRY

Paper VI

(Unit Operation–III)

(Saturday, 21-12-2024) **Time : 2.00 p.m. to 4.00 p.m.**

Time—Two Hours *Maximum Marks*—40

N.B. :— (*i*) Use log table and scientific calculator is allowed.

(*ii*) *All* questions carry equal marks.

1. What is supersaturation ? Explain in detail method of supersaturation and theory of supersaturation. 15

Solve the following problems :

(*i*) Find the yield of $Na_2S_2O_3.5H_2O$ crystals when 100 kg of 48% $Na_2S_2O_3$ solution is cooled to 293 K (20°C). Also calculate the percentage yield of the hydrated crystals. (At. wt : Na = 23, S = 32, O = 16, H = 1). Data solubility of $Na_2S_2O_3$ is 70 parts per 100 parts water at 293 K (20°C). 8

P.T.O.

(*ii*) Ammonia from a ammonia air mixture is to be absorbed in an absorption tower using water as a solvent. Data for the absorption system is as follows : Air flow rate – 200 kg/h, liquid phase compositions :

At the top of packing – 0.000013 kg NH_3/kg H_2O

At the bottom of packing – 0.0006 kg NH_3/kg H_2O

Gas phase compositions :

At the bottom of packing – 0.0084 kg NH_3/kg inert gas,

At the top of packing – 0.0044 kg NH_3/kg inert gas.

Calculate the flow rate of water entering the absorption tower. 7

2. Explain analysis of fractionating column by McCabe method with respect to distillation. 15

Solve the following problems :

(*i*) The vapour pressure of *n* heptane (A) and *n* octane (B) are given in the following table. Assume that Raoult's and Dalton's laws apply. Compute vapour liquid equilibria at constant pressure of 101.325 kPa

Boiling point of *n*-heptane (A) = 371.4 K (98.4°C)

Boiling point of *n* octane (B) = 398.6 K (125.6°C) 8

7°C	98.4	105	110	115	120	125.6
TK	371.4	378	383	388	393	398.6
P^o_A kPa	101.325	125.323	139.988	159.987	179.985	205.316
P^o_B kPa	44.39	55.59	64.528	74.79	86.65	101.325

(*ii*) Find the yield of $Na_2S_2O_3.5H_2O$ crystals when 100 kg of 48% $Na_2S_2O_3$ solution is cooled to 293 K (20°C). Also calculate the percentage yield of the hydrated crystals. (At wt. : Na = 23, S = 32, O = 16, H = 1)

Data : Solubility of $Na_2S_2O_3$ is 70 parts per 100 parts water at 293 k (20°C). 7

3. Write short notes on any *two* : 10

(*a*) Agitated tank crystalliser

(*b*) Pulsed column for liquid-liquid extraction

(*c*) Simple distillation

(*d*) Raoult's law of distillation.

This question paper contains **2** printed pages]

VA—268—2024

FACULTY OF SCIENCE

B.Sc. (Second Year) (Third Semester) EXAMINATION

NOVEMBER/DECEMBER, 2024

(New Pattern)

INDUSTRIAL CHEMISTRY

Paper VII

(Chemical Reaction Engineering–I)

(Tuesday, 24-12-2024) **Time : 2.00 p.m. to 4.00 p.m.**

Time—Two Hours *Maximum Marks*—40

N.B. :— (*i*) Scientific calculator is allowed.

(*ii*) Solve *all* questions.

1. From the following data show that decomposition of Hydrogen peroxide in aqueous solution is a first order reaction. What is the value of rate constant : 15

Time in Min	N
0	25
10	20
20	15.7
30	12.5
40	9.6

Where N is the number of Ml of $KMnO_4$ required to decomposition of definite volume of H_2O_2 ?

P.T.O.

Or

Derive the equation for irreversible biomolecular type second order reaction :

(*a*) In term of concentration 7

(*b*) In term of conversion. 8

2. Give the classification of chemical reaction in detail. 15

Or

At 500 K the rate of biomolecular reaction is 10 times the rate at 400 K. Find the activation energy for reaction : 15

(*a*) From Arrhenius law

(*b*) From collision theory

(*c*) What is the % difference in rate of reaction at 600 K predicted by those two methods.

3. Write short notes on (any *two*) : 10

(*a*) Elementary and non-elementary reaction

(*b*) Autocatalytic reaction

(*c*) In Haber process ammonia manufacturing :

$$N_2(g) + 3H_2(g) \longrightarrow 2NH_3(g)$$

the rate of appears of NH_3 is :

$$\frac{d[NH_3]}{dt} = 2 \times 10^{-4} \text{ mol } L^{-1} S^{-1},$$

find the rate of reaction of N_2H_2.

(*d*) Zero order reaction.

This question paper contains **2** printed pages]

VA—59—2024

FACULTY OF ARTS & SCIENCE

B.A./B.Sc. (Second Year) (Third Semester) EXAMINATION

NOVEMBER/DECEMBER, 2024

(New Pattern)

MATHEMATICS

Paper–VI

(Real Analysis-I)

(Tuesday, 10-12-2024) **Time : 2.00 p.m. to 4.00 p.m.**

Time—2 *Hours* *Maximum Marks*—40

N.B. :— (*i*) *All* questions are compulsory.

(*ii*) Figures to the right indicate full marks.

1. (*a*) Define the properties of field structure and order structure. Hence show that the set of real numbers is complete-ordered field. 15

Or

(*b*) Define the Cauchy sequence. Prove that a necessary and sufficient condition for the convergence of sequence $\{S_n\}$ is that, for each $\varepsilon > 0$ there exist a positive integer m such that $|S_{n+p} - S_n| < \varepsilon, \forall\, n \geq m$ and $p \geq 1$. 8

(*c*) Show that $\lim_{n\to\infty} \frac{3 + 2\sqrt{n}}{\sqrt{n}} = 2$. 7

P.T.O.

2. (*a*) Prove that every absolute convergence series is convergent. Also show that for any fixed value of x, the series $\sum_{n=1}^{\infty} \frac{\sin(nx)}{n^2}$ is convergent. 15

Or

(*b*) If $\sum_{n=1}^{\infty} u_n$ and $\sum_{n=1}^{\infty} v_n$ are two positive terms series such that $\lim_{n\to\infty} \frac{u_n}{v_n} = l$ where l is non-zero finite number, then two series converge or diverge together. 8

(*c*) Show that the series $1 + \frac{1}{2!} + \frac{1}{3!} + \frac{1}{4!} ..... + \frac{1}{n!}$ is convergent. 7

3. Attempt any *two* of the following : 10

(*a*) Prove that, the rational numbers in [0, 1] is not countable.

(*b*) Prove that, a necessary and sufficient condition for the convergence of a monotonic sequence is that it is bounded.

(*c*) Show that the series $x + \frac{x^2}{2!} + \frac{x^3}{3!} + ...$ converges absolutely for all the values of x.

(*d*) Write the statements of Cauchy's root test and D' Alembert's ratio test.

This question paper contains **3** printed pages]

VA—74—2024

FACULTY OF SCIENCE

B.Sc. (Second Year) (Third Semester) EXAMINATION

NOVEMBER/DECEMBER, 2024

(New Pattern)

MATHEMATICS

Paper VII

(Group Theory)

(Thursday, 12-12-2024) **Time : 2.00 p.m. to 4.00 p.m.**

Time—Two Hours *Maximum Marks*—40

N.B. :— (*i*) Attempt *All* questions.

(*ii*) Figures to the right indicate full marks.

1. If $f : X \to Y$ and $g : Y \to Z$ be two one-one and onto maps, then prove that $g o f : X \to Z$ is also one-one and onto. Also prove that : 15

$$(g o f)^{-1} : Z \to X = (f^{-1} o g^{-1}) : Z \to X$$

Or

(*a*) State and prove Lagrange's theorem. 8

(*b*) If H is a subgroup of the group G, then prove that there is one-to-one correspondence between any two right cosets of H in G. 7

P.T.O.

2. If f is a homomorphism of a group G into a group G', then prove that : 15

(*i*) $f(e) = e'$, where e is the identity of G and e' is the identity of G'.

(*ii*) $f(a^{-1}) = [f(a)]^{-1}$, for all $a \in G$.

(*iii*) If the order of $a \in G$ is finite, then the order of $f(a)$ a divisor of the order of a.

Or

(*a*) Prove that a non-empty subset H of a group G is a subgroup of G if and only if : 8

(*i*) $a \in H,\ b \in H \Rightarrow ab \in H$

(*ii*) $a \in H \Rightarrow a^{-1} \in H$

where a^{-1} is the inverse of a in G.

(*b*) Let $f = \begin{pmatrix} 1 & 2 & 3 \\ 1 & 3 & 2 \end{pmatrix}$ and $g = \begin{pmatrix} 1 & 2 & 3 \\ 2 & 3 & 1 \end{pmatrix}$ be two permutations of degree 3, then find fg and gf. Is $fg = gf$? 7

3. Attempt any *two* of the following : 5 each

(*a*) Let I be the set of integers and R be the relation in I defined by, for $x, y \in I$, $x R y$ iff $x - y$ is divisible by 5. Then prove that R is an equivalence relation.

(*b*) Prepare the composition table for the group G = {0, 1, 2, 3, 4} with respect to 'addition modulo 5' and write down the inverse of each element of G.

(*c*) Prove that every cyclic group is an abelian group.

(*d*) Let G be a group and let e be the identity element of G. Then prove that the mapping $f : G \to G$ defined by $f(a) = e$, for all $a \in G$ is a homomorphism of G into G.

This question paper contains **3** printed pages]

VA—89—2024

FACULTY OF SCIENCE AND TECHNOLOGY

B.Sc. (Second Year) (Third Semester) EXAMINATION

NOVEMBER/DECEMBER, 2024

(New Pattern)

MATHEMATICS

Paper-VIII

(Ordinary Differential Equations)

(Saturday, 14-12-2024) **Time : 2.00 p.m. to 4.00 p.m.**

Time—2 *Hours* *Maximum Marks*—40

N.B. :— (1) *All* questions are compulsory.

(2) Figures to the right indicate full marks.

(3) Attempt (A) *or* (B) (*a*), (*b*) in questions **1** and **2**.

1. Attempt either (A) *or* (B) of the following questions :

(A) Explain the method to solve the linear equation of the first order :

$$\frac{dy}{dx} + \mathrm{P}y = \mathrm{Q},$$

where P and Q are functions of x or constant, also solve :

$$\cos^2 x \frac{dy}{dx} + y = \tan x.$$ 15

P.T.O.

Or

(B) (*a*) Explain the method of solving the non-homogeneous differential equation of the first degree in x and y of the form : 8

$$\frac{dy}{dx} = \frac{ax + by + c}{a'x + b'y + c'}$$

(*b*) Find the integrating factor by inspection of : 7

$$(1 + xy)ydx + (1 - xy)xdy = 0.$$

2. Attempt (A) *or* (B) of the following questions :

(A) Explain the method for finding particular integral corresponding to a term of the form e^{ax} in the second member of : 15

$$\frac{d^n y}{dx^n} + P_1 \frac{d^{n-1} y}{dx^{n-1}} + \ldots\ldots\ldots P_n y = X.$$

Also solve $\frac{d^3 y}{dx^3} - y = (e^x + 1)^2$.

Or

(B) (*a*) Find the complementary function of the differential equation : 8

$$x^n \frac{d^n y}{dx^n} + P_1 x^{n-1} \frac{d^{n-1} y}{dx^{n-1}} + \ldots\ldots\ldots P_n y = X,$$

where P_1, P_2, ..., P_n are constants and X is a function of x.

(*b*) Solve : $2\frac{d^2 x}{dt^2} + 5\frac{dx}{dt} - 12x = 0$. 7

3. Attempt any *two* of the following : 5 each

(*a*) Solve : $\frac{dy}{dx}+\sqrt{\frac{1-y^2}{1-x^2}}=0$

(*b*) Solve : $x\frac{dy}{dx}-ay=x+1$.

(*c*) Solve : $\frac{d^3y}{dx^3}-3\frac{d^2y}{dx^2}+4y=0$.

(*d*) Solve : $(D^3 + 3D^2 + 2D)y = x^2$.

This question paper contains **2** printed pages]

VA—111—2024

FACULTY OF SCIENCE AND TECHNOLOGY

B.Sc. (Second Year) (Third Semester) EXAMINATION

NOVEMBER/DECEMBER, 2024

(New Pattern)

MICROBIOLOGY

Paper-VI

(Applied Microbiology)

(Tuesday, 17-12-2024) **Time : 2.00 p.m. to 4.00 p.m.**

Time—2 *Hours* *Maximum Marks*—40

N.B. :— (1) Attempt *all* questions.

(2) Draw well labelled diagrams wherever necessary.

1. Write composition of air. Define droplets and droplet nuclei. Describe sources of microorganism in air. 15

Or

Write notes on :

(*a*) Water borne diseases. 8

(*b*) Types of water. 7

2. Define sewage. Describe different methods of aerobic sewage treatment in detail. 15

Or

Write notes on :

(*a*) Pasteurization of milk. 8

(*b*) MBRT. 7

P.T.O.

3. Write short notes on (any *two*) : 10

(*a*) Impingement in liquid

(*b*) Membrane filter technique

(*c*) Chlorination and disposal of sludge

(*d*) Milk as a culture medium.

This question paper contains **2** printed pages]

VA—155—2024

FACULTY OF SCIENCE

B.Sc. (Second Year) (Third Semester) EXAMINATION

NOVEMBER/DECEMBER, 2024

(New Pattern)

MICROBIOLOGY

Paper–VII

(Immunology)

(Thursday, 19-12-2024) **Time : 2.00 p.m. to 4.00 p.m.**

Time—2 *Hours* *Maximum Marks*—40

N.B. :— (*i*) Attempt *all* questions.

(*ii*) Represent your answer with suitable diagrams if necessary.

(*iii*) Answer to the point.

1. Define the term immunity. Describe different classes of immunity with suitable examples. 15

Or

Write notes on :

(*a*) Cell mediated immune response. 8

(*b*) Bacterial antigens with reference to *S. typhi*. 7

2. What is hypersensitivity ? Describe type-I hypersensitivity with suitable example. 15

P.T.O.

Or

Explain briefly :

(*a*) Complement fixation test. 8

(*b*) ELISA. 7

3. Write short notes on (any *two*) : 10

(*a*) Sources of infection

(*b*) Side chain theory

(*c*) Radioimmunoassay

(*d*) Blood transfusion reaction.

This question paper contains **2** printed pages]

VA—29—2024

FACULTY OF SCIENCE

B.Sc. (Second Year) (Third Semester) EXAMINATION

NOVEMBER/DECEMBER, 2024

(New Pattern)

PHYSICS

Paper–VI

(Waves and Oscillation)

(Thursday, 5-12-2024) **Time : 2.00 p.m. to 4.00 p.m.**

Time—2 *Hours* *Maximum Marks*—40

N.B. :— (*i*) Attempt *all* questions.

(*ii*) Illustrate your answers with suitably well labelled diagram, wherever necessary.

1. Derive an expression for analytically treatment of stationary wave in an open end organe pipe. 15

Or

(*a*) Derive an expression of energy of plane progressive wave. 8

(*b*) Derive the relation between wave velocity and particle velocity. 7

P.T.O.

2. Define damped vibration. Derive differential equation for damped harmonic motion. 15

Or

(*a*) Explain piezoelectric oscillator for the production of ultrasonic waves. 8

(*b*) Explain the term detection of ultrasonic waves. 7

3. Attempt any *two* of the following :

(*a*) Derive the differential equation of wave motion. 5

(*b*) Derive an investigation of pressure and density changes at Node and Antinode 5

(*c*) State the conditions for good acoustical design of an auditorium 5

(*d*) Explain sharpness of Resonance. 5

This question paper contains **2** printed pages]

VA—47—2024

FACULTY OF SCIENCE

B.Sc. (Second Year) (Third Semester) EXAMINATION

NOVEMBER/DECEMBER, 2024

(New Pattern)

PHYSICS

Paper–VII

(Statistical Physics, Electromagnetic and Theory of Relativity)

(Saturday, 7-12-2024) **Time : 2.00 p.m. to 4.00 p.m.**

Time—2 *Hours* *Maximum Marks*—40

N.B. :— (*i*) Attempt *all* questions.

(*ii*) Log table is allowed.

(*iii*) Non-programmable calculator is allowed.

(*iv*) Figures to the right hand side indicate full marks.

1. Derive an expression for Maxwell-Boltzmann distribution law. 15

Or

(*a*) Explain entropy and thermodynamic probability relation. 8

(*b*) Explain briefly the terms micro and macro states. 7

2. State the postulates of special theory of relativity. Derive on expression for mass-energy relation. 15

P.T.O.

Or

(*a*) Explain the generalization of Ampere's law and displacement current. 8

(*b*) Explain electromagnetic wave equation in terms of H. 7

3. Attempt any *two* of the following : 10

(*a*) Derive the expression for Galilean transformation.

(*b*) Write a note on electromagnetic energy.

(*c*) Write a note on thermodynamic probability.

(*d*) Describe the application of quantum statistics to photon gas.

This question paper contains **2** printed pages]

VA—60—2024

FACULTY OF SCIENCE

B.Sc. (Second Year) (Third Semester) EXAMINATION

NOVEMBER/DECEMBER, 2024

(New Pattern)

ZOOLOGY

Paper–VI

(Physiology)

(Tuesday, 10-12-2024) **Time : 2.00 p.m. to 4.00 p.m.**

Time—2 *Hours* *Maximum Marks*—40

N.B. :— (*i*) Attempt *all* questions.

(*ii*) Illustrate your answers with suitable and labelled diagrams wherever necessary.

1. Describe in detail sources and deficiency diseases of fat soluble vitamins. 15

Or

(*a*) Describe conduction of cardiac impulse. 8

(*b*) Describe structure of human kidney. 7

2. Describe structure of neuron and add a note on conduction of nerve impulse. 15

Or

(*a*) Explain histological structure of human testes. 8

(*b*) Explain functions and hormonal disorders of adrneal gland. 7

P.T.O.

3. Write short notes on any *two* of the following : 10

(*a*) Kinds of digestion

(*b*) Blood pressure

(*c*) Types of neurons

(*d*) Menstrual cycle.

This question paper contains **2** printed pages]

VA—75—2024

FACULTY OF SCIENCE AND TECHNOLOGY

B.Sc. (Second Year) (Third Semester) EXAMINATION

NOVEMBER/DECEMBER, 2024

(New Course)

ZOOLOGY

Paper-VII

(Biochemistry)

(Thursday, 12-12-2024) **Time : 2.00 p.m. to 4.00 p.m.**

Time—2 *Hours* *Maximum Marks*—40

N.B. :— (1) Attempt *all* questions.

(2) Illustrate your answers with suitable and labelled diagrams wherever necessary.

1. Explain in detail structure of Lipids. 15

Or

(*a*) Describe electrochemical properties of water. 8

(*b*) Explain E-S complex formation and Lock and Key model. 7

2. Describe in detail HMP shunt. 15

Or

(*a*) Write in detail Ketosis and Ketogenesis. 8

(*b*) Describe ornithine cycle. 7

P.T.O.

3. Attempt any *two* of the following : 10

(*a*) Polysaccharides

(*b*) Factors affecting enzyme activity

(*c*) Glycogenesis

(*d*) Transamination.

This question paper contains **2** printed pages]

VA—52—2024

FACULTY OF SCIENCE AND TECHNOLOGY

B.Sc. (Second Year) (Fourth Semester) EXAMINATION

NOVEMBER/DECEMBER, 2024

(New Course)

BOTANY

Paper–IX

(Plant Metabolism and Biotechnology)

(Monday, 9-12-2024) **Time : 2.00 p.m. to 4.00 p.m.**

Time—2 *Hours* *Maximum Marks*—40

N.B. :— (*i*) Attempt *all* questions.

(*ii*) Figures to the right indicate full marks.

(*iii*) Illustrate your answer with suitable diagrams.

1. Describe in detail non-cyclic photophosphorylation process in photosynthesis. 15

Or

(*a*) Explain the mechanism of enzyme action. 8

(*b*) Nitrogen cycle. 7

2. What are cybrids ? Describe in detail somatic hybridization in plants. 15

P.T.O.

Or

(*a*) Explain PCR and its applications. 8

(*b*) cDNA Library. 7

3. Write short notes on any *two* of the following : 10

(*a*) CAM

(*b*) Holoenzyme

(*c*) Synthetic seeds

(*d*) NCBI.

This question paper contains **2** printed pages]

VA—37—2024

FACULTY OF SCIENCE AND TECHNOLOGY

B.Sc. (Second Year) (Fourth Semester) EXAMINATION

NOVEMBER/DECEMBER, 2024

(CBCS/New Pattern)

BOTANY

Paper–VIII

(Plant Embryology)

(Friday, 6-12-2024) **Time : 2.00 p.m. to 4.00 p.m.**

Time—2 *Hours* *Maximum Marks*—40

N.B. *:—* (*i*) Attempt *all* questions.

(*ii*) Draw neat and well lebelled diagrams wherever necessary.

(*iii*) *All* questions carry equal marks.

1. Describe T.S. of Anther and add a note on palynology. 15

Or

Describe in brief.

(*a*) Agents of pollination 8

(*b*) Self-pollination 7

P.T.O.

2. Define embryo. Describe in detail development of crucifer type of embryo. 15

Or

Describe in brief :

(*a*) Development of monosporic embryo sac. 8

(*b*) Structure of Anatropous ovule. 7

3. Attempt any *two* out of four : 10

(*a*) Contribution of P. Maheshwari in Embryology.

(*b*) Advantages of Cross Pollination

(*c*) Significance of double fertilization

(*d*) Seed dispersal.

This question paper contains **2** printed pages]

VA—23—2024

FACULTY OF SCIENCE AND TECHNOLOGY

B.Sc. (Second Year) (Fourth Semester) EXAMINATION

NOVEMBER/DECEMBER, 2024

(New Pattern)

CHEMISTRY

Paper–IX

(Physical and Inorganic Chemistry)

(Wednesday, 4-12-2024) **Time : 2.00 p.m. to 4.00 p.m.**

Time—2 *Hours* *Maximum Marks*—40

N.B. :— (*i*) *All* questions are compulsory.

(*ii*) Figures to the right indicate full marks.

(*iii*) Use of logarithmic table and calculator is allowed.

1. Answer any *three* of the following : 15

(*a*) Explain XY_5 type Inter-halogen compound with example.

(*b*) Define Zeolite. Discuss its classifications.

(*c*) Explain strength and stability of oxyacids of halogens.

(*d*) Define carbides. Give preparation, properties and structure of CaC_2.

(*e*) What are polyhalides ? Give preparation, properties and structure of ICl^-_4.

P.T.O.

2. Solve any *three* of the following : 15

(*i*) What is half life period ? State and derive half life for second order reaction.

(*ii*) Define first order reaction and give its characteristics.

(*iii*) Define specific conductance and give effect of dillution and temperature on it.

(*iv*) State Kohlrausch law, name its applications.

(*v*) When a substance was exposed to light for 20 minutes, 0.002 mole of it reacted. In the same time it absorbed 2×10^6 photons per second. Calculate quantum yield of the reaction. ($N = 6.02 \times 10^{23}$).

3. Answer any *two* of the following : 10

(*a*) Derive rate equation for rate constant of second order reaction with $a \neq b$

(*b*) The resistance of 0.1 N solution was placed between two electrodes which are 0.72 cm apart and cross-section area 2.25 cm^2 was 52.40 ohms. Calculate equivalent conductance.

(*c*) What are the advantages of conductometric titration ? Discuss precipitation titration.

(*d*) State and explain Lambert-Beer's law.

This question paper contains **3** printed pages]

VA—12—2024

FACULTY OF SCIENCE

B.Sc. (Second Year) (Fourth Semester) EXAMINATION

NOVEMBER/DECEMBER, 2024

(CBCS/New Patterns)

CHEMISTRY

Paper–VIII

(Organic and Inorganic Chemistry)

(Monday, 02-12-2024) **Time : 2.00 p.m. to 4.00 p.m.**

Time—2 *Hours* *Maximum Marks*—40

N.B. *:—* Attempt *all* questions.

1. Solve any *three* of the following : 15

   (*a*) Give the electronic configuration of second transition series elements.

   (*b*) What are Lanthanide contraction ? Give the consequences of Lanthanide contraction.

   (*c*) Give the outermost electronic configuration of actinide series elements.

   (*d*) Explain the following properties of first transition series elements :

      (*i*) Colour

      (*ii*) Magnetic properties.

   (*e*) Compare the properties of '*d*'-block elements with '*f*' block elements.

P.T.O.

2. Solve any *three* of the following : 15

(*a*) How will you convert glucose to mannose ?

(*b*) What is stereoisomerism ? Give the 'R' and 'S' configuration of the following compounds :

(*i*) Bromochloroiodomethane

(*ii*) 1-phenyl ethanol.

(*c*) What are aromatic amines ? What is the action of the following on aniline ?

(*i*) $C_6H_5 - \overset{\overset{O}{||}}{C} - Cl$

(*ii*) CS_2

(*iii*) $HNO_2 + HCl$

(*iv*) $C_6H_5 - CHO$.

(*d*) Discuss the conformational analysis of *n*-butane

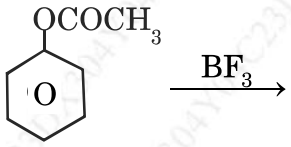
(*e*) Predict the product :

(*i*) $CH_3CHO \xrightarrow{SeO_2}$

(*ii*) $CH_3 - O - CH_3 + CO \xrightarrow{BF_3}$

(*iii*) $CH_2 = CH_2 \xrightarrow{O_sO_4}$

(*iv*) $C_6H_5CH_2OH \xrightarrow{SeO_2}$

(*v*)  $\xrightarrow{BF_3}$

3. Solve any *two* of the following : 10

(*a*) Explain Osazone formation of glucose with mechanism.

(*b*) Define the following terms :

(*i*) Asymmetric carbon atom

(*ii*) Enantiomers

(*iii*) Racemic mixture

(*iv*) Resolution

(*v*) Plane of symmetry.

(*c*) How will you prepare aniline from :

(*i*) Chlorobenzene

(*ii*) Phenol

(*iii*) Nitrobenzene.

Explain the following chemical reactions of aniline :

(*i*) Action of benzoyl chloride

(*ii*) Formation of *p*-nitroacetanilide

(*d*) How will you convert fructose to glucose ?

This question paper contains **2** printed pages]

VA—326—2024

FACULTY OF SCIENCE AND TECHNOLOGY

B.Sc. (Second Year) (Fourth Semester) EXAMINATION

NOVEMBER/DECEMBER, 2024

(New/CBCS Pattern)

COMPUTER SCIENCE

Paper IX

(Programming in Java)

(Thursday, 26-12-2024) **Time : 2.00 p.m. to 4.00 p.m.**

Time—Two Hours *Maximum Marks*—40

N.B. :— (*i*) *All* questions are compulsory.

(*ii*) Assume suitable data, if necessary.

1. Explain data types, variable and constants of Java in detail. 15

Or

(*a*) Explain Java features. 8

(*b*) Explain Java program structure. 7

2. What is inheritance ? Explain final variables and methods with suitable example. 15

P.T.O.

Or

(*a*) Explain Java API package. 8

(*b*) Explain arrays of Java. 7

3. Write short notes on any *two* of the following : 10

(*a*) Java and internet

(*b*) Command Line arguments

(*c*) Creating object

(*d*) Defining interface.

This question paper contains **2** printed pages]

VA—184—2024

FACULTY OF SCIENCE AND TECHNOLOGY

B.Sc. (Second Year) (Fourth Semester) EXAMINATION

NOVEMBER/DECEMBER, 2024

(New Pattern)

ELECTRONICS

Paper IX

(Introduction to Microcontroller Intel 8051)

(Friday, 20-12-2024) **Time : 2.00 p.m. to 4.00 p.m.**

Time—Two Hours *Maximum Marks*—40

N.B. :— (*i*) Attempt *All* questions.

(*ii*) Draw neat and labelled diagrams wherever necessary.

1. Draw block diagram of a microcontroller. Compare microcontroller and microprocessor. 15

Or

(*a*) Explain immediate and indirect modes of addressing of 8051 with a suitable instruction for each. 8

(*b*) Write addressing modes of the instructions MOV A, R_2, MOV A, 70H and CLRC and explain execution of each instruction with suitable data. 7

P.T.O.

2. Explain in detail Mode 0 and Mode 2 of timer T_1 of Intel 8051 microcontroller. 15

Or

(*a*) Write an ALP to add two bytes and its result with suitable input data. 8

(*b*) Write an ALP to multiply two 8-bit numbers and its output with suitable input data. 7

3. Write short notes on (any *two*) : 10

(*a*) Structure of internal RAM of 8051

(*b*) Classification of instructions of 8051

(*c*) Write ALP to determine 1's complement of a byte.

(*d*) Priority structure of interrupts in 8051.

This question paper contains **2** printed pages]

VA—120—2024

FACULTY OF SCIENCE

B.Sc. (Second Year) (Fourth Semester) EXAMINATION

NOVEMBER/DECEMBER, 2024

(New Pattern)

ELECTRONICS

Paper–VIII

(Oscillators and Multivibrators)

(Wednesday, 18-12-2024) **Time : 2.00 p.m. to 4.00 p.m.**

Time—2 *Hours* *Maximum Marks*—40

N.B. :— (*i*) Attempt *all* questions.

(*ii*) Illustrate your answer with labelled diagram wherever necessary.

1. Explain Hartley oscillator and derive equation for sustained oscillation and frequency in detail. 15

Or

(*a*) Explain concept of feedback and define positive and negative feedback. 8

(*b*) Derive equation for negative feedback. 7

2. Explain working of transistorised astable multivibrator and derive equation for frequency with necessary diagrams and waveforms. 15

P.T.O.

Or

(*a*) Explain fundamental of sweep voltage generator. 8

(*b*) Explain constant current sweep generator. 7

3. Answer any *two* of the following : 10

(*a*) Barkhausen criterion

(*b*) Advantage of negative feedback as gain stability

(*c*) Transistor as switch

(*d*) UJT as sweep generator.

This question paper contains **2** printed pages]

VA—281—2024

FACULTY OF SCIENCE AND TECHNOLOGY

B.Sc. (Second Year) (Fourth Semester) EXAMINATION

NOVEMBER/DECEMBER, 2024

(New Pattern)

FISHERY SCIENCE

Paper–IX

(Fishing Crafts and Gear Technology)

(Thursday, 26-12-2024) **Time : 2.00 p.m. to 4.00 p.m.**

Time—2 *Hours* *Maximum Marks*—40

N.B. :— (*i*) *All* questions are compulsory.

(*ii*) Marks of each question are written on right hand side of respective questions.

(*iii*) Illustrate answers with suitable and well labelled diagrams wherever necessary.

1. Describe in detail different marine fishing crafts used in India. 15

Or

Write notes on :

(*a*) Classification of fishing gear. 8

(*b*) Care and maintenance of fishing gears. 7

P.T.O.

2. Explain in detail Electro-Fishing. 15

Or

Write notes on :

(*a*) Gill net. 8

(*b*) Rampani net. 7

3. Write notes on any *two* of the following : 10

(*a*) Floats

(*b*) Trammel net

(*c*) RADAR

(*d*) Fishing by hunting.

This question paper contains **2** printed pages]

VA—283—2024

FACULTY OF SCIENCE

B.Sc. (Second Year) (Fourth Semester) EXAMINATION

NOVEMBER/DECEMBER, 2024

(New Pattern)

INDUSTRIAL CHEMISTRY

Paper–IX

(Pollution Monitoring and Control)

(Thursday, 26-12-2024) **Time : 2.00 p.m. to 4.00 p.m.**

Time—2 *Hours* *Maximum Marks*—40

N.B. :— Attempt *all* questions.

1. Explain in detail mechanical and biological treatment methods of sewage. 15

Or

(*a*) Describe overall effect on quality of human life and environment by chemical industries. 7

(*b*) Explain Air (Prevention and Control of Pollution) Act, 1981. 8

2. Write in detail procedures are generally involved in treatment of Sewage. 15

P.T.O.

Or

(*a*) Explain the method of gas analysis of NOx. 7

(*b*) Describe analysis of suspended particulate matter. 8

3. Write short notes on (any *two*) : 10

(*a*) Sewage and its composition

(*b*) Solid Industrial Waste

(*c*) Industrial emission

(*d*) Biosphere.

This question paper contains **3** printed pages]

VA—68—2024

FACULTY OF SCIENCE AND ARTS

B.A./B.Sc. (Second Year) (Fourth Semester) EXAMINATION

NOVEMBER/DECEMBER, 2024

MATHEMATICS

Paper-IX

(Real Analysis-II)

(Wednesday, 11-12-2024) **Time : 2.00 p.m. to 4.00 p.m.**

Time—2 *Hours* *Maximum Marks*—40

N.B. :— (1) Attempt *all* questions.

(2) Figures to the right indicate full marks.

1. (*i*) If a bounded function f is integrable on $[a, b]$, then it is also integrable on $[a, c]$ and $[c, b]$, where c is the point of $[a, b]$.

(*ii*) Conversely, if f is bounded and integrable on $[a, c]$, $[c, b]$, then it is also integrable on $[a, b]$.

(*iii*) Also in either case,

$$\int_a^b f\,dx = \int_a^c f\,dx + \int_c^b f\,dx, \quad a \le c \le b. \qquad 15$$

P.T.O.

Or

(*a*) If a function f is bounded and integrable on each of the intervals $[a, c]$ $[c, b]$, $[a, b]$, where c is a point of $[a, b]$, then

$$\int_a^b f\,dx = \int_a^c f\,dx + \int_a^b f\,dx .$$ 8

(*b*) If a function f is monotonic on $\{a, b]$, then it is integrable on $[a, b]$. 7

2. Prove that the improper integral $\int_a^b \frac{dx}{(x-a)^n}$ converges. If and only if $n < 1$.

Also test the convergence of $\int_a^{\frac{\pi}{2}} \frac{\sin x}{x^p} dx$. 15

Or

(*a*) If f and g are positive and $f(x) \leq g(x)$, for all x in $[a, x]$, then : 8

(*i*) $\int_a^\infty f\,dx$ converges if $\int_a^\infty g\,dx$ converges, and

(*ii*) $\int_a^\infty g\,dx$ diverges, if $\int_a^\infty f\,dx$ diverges.

(*b*) A function ϕ is bounded in $[q, \infty]$ and integrable in $[a, X]$, where X is a number $\geq a$. If $\int_a^\infty f\,dx$ is absolutely converges at ∞, then show

that $\int_a^\infty f\,dx$ is also absolutely convergent at ∞. 7

3. Attempt any *two* :

(*a*) Show that a constant function k is integrable and $\int_a^b k\,dx = k(b - a)$. 5

(*b*) Show that $\int_1^2 f\,dx = \frac{11}{2}$, where $f(x) = 3x + 1$. 5

(*c*) Examine the convergence of $\int_0^2 \frac{dx}{2^x - x^2}$. 5

(*d*) Examine the convergence of $\int_a^\infty \frac{\sin^2 x}{x^2} dx$. 5

This question paper contains **2** printed pages]

VA—81—2024

FACULTY OF SCIENCE AND TECHNOLOGY

B.Sc. (Second Year) (Fourth Semester) EXAMINATION

NOVEMBER/DECEMBER, 2024

(New Pattern)

MATHEMATICS

Paper–X

(Ring Theory)

(Friday, 13-12-2024) **Time : 2.00 p.m. to 4.00 p.m.**

Time—2 *Hours* *Maximum Marks*—40

N.B. :— (*i*) *All* questions are compulsory.

(*ii*) Figures to the right indicate full marks.

1. A ring R is without zero divisors if and only if the cancellation laws hold in R. 15

Also prove that a skew field has no divisors of zero.

Or

(*a*) Define isomorphism of rings. If f is an isomorphism of a ring R onto a ring R', then prove that : 8

(*i*) If R is without zero divisors, then R' is also a without zero divisors.

(*ii*) If R is with unit element, then R' is also with unit element.

P.T.O.

(*b*) Prove that the characteristic of an integral domain is either zero or a prime number. 7

2. Prove that an ideal S of a commutative ring R with unity is matimal ideal if and only if the residue class ring R/S is a field. 15

Or

(*a*) Find out the units of the integral domain of Gaussian integers. 8

(*b*) If D is an integral domain, then the polynomial ring D(x) is also an integral domain. 7

3. Attempt any *two* of the following : 10

(*a*) If a, b, c, d are any elements of a ring R, prove that

$(a - b)(c - d) = (ac + bd) - (ad + bc)$.

(*b*) If R is a ring and $a \in R$. Let $T = \{x \in R : ax = 0\}$. Prove that T is a right ideal of R.

(*c*) Add and multiply the following polynomials over the ring

$(I_6, +_6, \times_6)$

$f(x) = 2x^\circ + 5x + 3x^2$

$g(x) = x^\circ + 4x + 2x^2$.

(*d*) If f is a homomorphism of a ring R into a ring R' with kernel S, then S is an ideal of ring R.

This question paper contains **3** printed pages]

VA—94—2024

FACULTY OF SCIENCE

B.Sc. (Second Year) (Fourth Semester) EXAMINATION

NOVEMBER/DECEMBER, 2024

MATHEMATICS

Paper-XI

(Partial Differential Equations)

(Monday, 16-12-2024) **Time : 2.00 p.m. to 4.00 p.m.**

Time—2 *Hours* *Maximum Marks*—40

N.B. :— (1) *All* questions are compulsory.

(2) Figures to the right indicate full marks.

1. Explain the method of multipliers to solve partial differential equation $P_p + Q_q = R$. 15

Solve :

$$(x^2 - yz)p + (y^2 - zx)q = z^2 - xy.$$

Or

(*a*) Explain Charpit's method to solve partial differential equation : 8

$$f(x, y, z, p, q) = 0.$$

(*b*) Solve : 7

$$(D^3 - 4D^2D' + 3DD'^2)\, Z = 0.$$

P.T.O.

2. Explain complementary function of non-homogeneous linear equation : 15

$$(D - mD' - a)\, z = 0$$

Solve :

$$(D - D' - 2)\,(D - D' - 3)\, Z = e^{3x - 2y}.$$

Or

(*a*) Obtain the solution of the wave equation : 8

$$\frac{\partial^2 y}{\partial t^2} = c^2 \frac{\partial^2 y}{\partial x^2}$$

using the method of separation of variables.

(*b*) Find the solution of $\frac{\partial^2 u}{\partial x^2} = h^2 \frac{\partial u}{\partial t}$ for which $u(o, t) = u(l, t) = 0$

$u(x, 0) = \sin\frac{\pi x}{l}$ by method of variable separable. 7

3. Attempt any *two* of the following : 10

(*a*) Solve :

$$\frac{\partial^2 z}{\partial x \partial y} = x^2 y$$

Subject to the condition $z(x, 0) = x^2$ and $z(1, y) = \cos y$.

(*b*) Explain the method to solve equation of the type $f(z, p, q) = 0$.

(*c*) Using the method of separation of variables, solve :

$$\frac{\partial u}{\partial x} = 2\frac{\partial u}{\partial t} + u,$$

where $u(x, 0) = \sigma e^{-3x}$

(*d*) Solve :

$$\frac{\partial^2 u}{\partial r^2} + \frac{1}{r} \cdot \frac{\partial u}{\partial r} + \frac{1}{r^2}\frac{\partial^2 u}{\partial \theta^2} = 0$$

by the method of separation of variables.

This question paper contains **2** printed pages]

VA—183—2024

FACULTY OF SCIENCE AND TECHNOLOGY

B.Sc. (Second Year) (Fourth Semester) EXAMINATION

NOVEMBER/DECEMBER, 2024

(New Pattern)

MICROBIOLOGY

Paper IX

(Medical Microbiology)

(Friday, 20-12-2024) **Time : 2.00 p.m. to 4.00 p.m.**

Time—Two Hours *Maximum Marks*—40

N.B. :— (*i*) Attempt *All* questions.

(*ii*) Illustrate your answers with suitably labelled diagrams wherever necessary.

1. Describe in detail pathogenesis, laboratory diagnosis and prophylaxis of syphilis. 15

Or

Write notes on :

(*a*) Structure of HIV. 8

(*b*) Structure of HBV. 7

P.T.O.

2. Enumerate the virulence factors of S. typhi and write about pathogenesis and laboratory diagnosis of enteric fever. 15

Or

Write notes on :

(*a*) Sexual life cycle of plasmodium species. 8

(*b*) Laboratory diagnosis of candida albicans. 7

3. Write short notes on (any *two*) : 10

(*a*) Cholera red reaction

(*b*) Biochemical characteristics of staphylococcus aureus

(*c*) VDRL

(*d*) Vaccines.

This question paper contains **2** printed pages]

VA—119—2024

FACULTY OF SCIENCE

B.Sc. (Second Year) (Fourth Semester) EXAMINATION

NOVEMBER/DECEMBER, 2024

(New Pattern)

MICROBIOLOGY

Paper–VIII

(Food, Soil Microbiology and Microbial Ecology)

(Wednesday, 18-12-2024) **Time : 2.00 p.m. to 4.00 p.m.**

Time—2 *Hours* *Maximum Marks*—40

N.B. :— (*i*) Attempt *all* questions.

(*ii*) Draw a well labelled diagrams wherever necessary.

1. Explain in detail various methods of food preservation. 15

Or

Explain the following :

(*a*) Composition of soil. 8

(*b*) Signification of microorganisms in soil. 7

2. Explain in detail Nitrogen cycle. 15

P.T.O.

Or

Write on the following :

(*a*) Microbe-Microbe interaction. 8

(*b*) Biofertilizer. 7

3. Write short notes on (any *two*) : 10

(*a*) Sources of contamination of food

(*b*) Cellulose in carbon cycle

(*c*) Draw a well labelled diagram of Sulfur cycle

(*d*) Rumen.

This question paper contains **2** printed pages]

VA—53—2024

FACULTY OF SCIENCE

B.Sc. (Second Year) (Fourth Semester) EXAMINATION

NOVEMBER/DECEMBER, 2024

(New Pattern)

PHYSICS

Paper–IX

(Basic Electronics)

(Monday, 9-12-2024) **Time : 2.00 p.m. to 4.00 p.m.**

Time—2 *Hours* *Maximum Marks*—40

N.B. *:— All* questions are compulsory and carry equal marks.

1. What do you mean by intrinsic and extrinsic semiconductor ? Explain the working of varactor diode. 15

Or

(*a*) Obtain an expression for collector current of CB connection. 8

(*b*) Determine hybrid (*h*) parameter equation for a transistor. 7

2. What are ideal characteristics of OP-AMP ? Draw and explain the circuit diagram of Inverting and Non-Inverting Amplifier. 15

P.T.O.

Or

(*a*) State and explain Barkhausen's criterion in detail. 8

(*b*) Draw the circuit diagram and explain operation of Colpitt's oscillator. 7

3. Write short notes on any *two* (each of **5** marks) : 10

(*a*) P-N Junction diode

(*b*) Output characteristics of CE transistor

(*c*) Common mode and differential mode signals

(*d*) R-C Network.

This question paper contains **2** printed pages]

VA—38—2024

FACULTY OF SCIENCE

B.Sc. (Second Year) (Fourth Semester) EXAMINATION

NOVEMBER/DECEMBER, 2024

(CBCS/New Pattern)

PHYSICS

Paper–VIII

(Optics and Lasers)

(Friday, 6-12-2024) **Time : 2.00 p.m. to 4.00 p.m.**

Time—2 *Hours* *Maximum Marks*—40

N.B. *:—* (*i*) Attempt *all* questions.

(*ii*) Log table is allowed.

1. Calculate the equivalent focal length of two thin co-axial lenses separated by a finite distance. 15

Or

(*a*) How will you determine the wavelength of light by Newton's rings ? 8

(*b*) Explain the Fraunhofer's diffraction produced due to single slit for monochromatic light. 7

P.T.O.

2. Describe a nicol prism and show how it can be used as an analyser. 15

Or

(*a*) Explain population inversion in lasers. 7

(*b*) Explain different properties of lasers. 8

3. Write short notes on (any *two*) : 10

(*a*) Cardinal points of an optical system.

(*b*) Brewster's Law.

(*c*) Rayleigh criterion for resolution.

(*d*) He-Ne Laser.

This question paper contains **2** printed pages]

VA—82—2024

FACULTY OF SCIENCE AND TECHNOLOGY

B.Sc. (Second Year) (Fourth Semester) EXAMINATION

NOVEMBER/DECEMBER, 2024

(New Pattern)

ZOOLOGY

Paper-IX

(Evolutionary Biology and Genetic Engineering)

(Friday, 13-12-2024) **Time : 2.00 p.m. to 4.00 p.m.**

Time—2 *Hours* *Maximum Marks*—40

N.B. :— (1) Attempt *all* questions.

(2) Illustrate your answer with suitable labelled diagram, wherever necessary.

1. Describe in detail Lamarck theory of evolution. 15

Or

(*a*) Explain causes and role of mass extinction in evolution. 8

(*b*) Illustrate adaptive radiation in Darwin's finches. 7

2. Give an account of enzymes used as a tools in recombinant DNA technology. 15

Or

(*a*) What is cloning ? Explain it with the examples of clonned animals. 8

(*b*) Describe gel electrophoresis. 7

3. Write short notes on any *two* of the following : 10

(*a*) Biochemical evidences of evolution.

(*b*) Modes of speciation

(*c*) Types of RNA

(*d*) P.C.R. (Polymerase Chain Reaction).

This question paper contains **2** printed pages]

VA—69—2024

FACULTY OF SCIENCE & TECHNOLOGY

B.Sc. (FS) (Second Year) (Fourth Semester) EXAMINATION

NOVEMBER/DECEMBER, 2024

(New Pattern)

ZOOLOGY

Paper-VIII

(Cell Biology and Genetics)

(Wednesday, 11-12-2024) **Time : 2.00 p.m. to 4.00 p.m.**

Time—2 *Hours* *Maximum Marks*—40

N.B. :— (1) Attempt all questions.

(2) Illustrate your answers with suitable and labelled diagrams wherever necessary.

1. Describe the structure of Eukaryotic cell. 15

Or

(*a*) Explain the Mendel's Law of Segregation. 8

(*b*) Give an account on Inhibitory factor. 7

2. What is crossing over ? Explain the mechanism of crossing over and its significance. 15

Or

(*a*) Explain chromosomal methods of sex determination with an example. 8

(*b*) Give an account on sex-linked inheritance in Drosophila. 4

P.T.O.

3. Write short notes on any *two* of the following : 10

(*a*) Golgi Complex

(*b*) Duplicate gene

(*c*) Types of Linkage

(*d*) Down Syndrome.